Mathematics Department Curriculum Map

Intent Statements

Key Stage 3

During KS3, our mathematics curriculum is a mastery approach so that students can make progress by building on their prior attainment, striving for excellence.

The subject content of our KS3 curriculum covers the key areas of number, algebra, ratio, proportion & rates of change, geometry & measures, probability and statistics.

Our students will take action to:
• Become increasingly fluent in the fundamentals of mathematics working with increasingly complex problems so that conceptual understanding deepens alongside the ability to recall and apply knowledge accurately;
• Reason mathematically by following a line of enquiry, exploring relationships and developing an argument or justification using mathematical language.
• Solve problems by applying their mathematics with increasing sophistication, including breaking down problems into a series of simpler steps and having resilience in seeking solutions.

Starting points and decisions about progression are based on the security of students' understanding, ensuring all students are ambitious in their learning. Those not sufficiently fluent are supported to practice and consolidate their understanding before moving onto more complex problems.

Key Stage 4

A tiered mathematics curriculum is in place so that students can make progress in KS4 with key topics nested within each tier. Students will consolidate their numerical, algebraic, geometrical, statistical and mathematical capability from KS3.

At KS4, students will show ambition by:

• Extending their understanding of the number system and using increasingly complex calculation strategies.
• Extending and formalising their knowledge of ratio and proportion, in working with proportional relations algebraically and graphically.
• Reasoning deductively in geometry, number and algebra, including using geometrical constructions.
• Making and using connections between different parts of mathematics to solve problems whilst using mathematical language, presentation and properties effectively, and with increasing precision.

During Key stage 4 all of our higher and foundation students will be prepared for the Edexcel 9-1 GCSE Mathematics qualification. Entry level is offered to ensure that all students complete KS4 with a recognised qualification in mathematics.

Key Stage 5

A level Mathematics is often thought of as a subject of complicated calculations dealing with highly abstract topics. The reason why so many employers highly value mathematics qualifications is that mathematics students become better at thinking logically and analytically.

At KS5, students will show ambition:
•Through solving problems students develop resilience and are able to think creatively and strategically.
•The writing of structured solutions, proof and justification of results help to formulate reasoned arguments.
•Their important development of excellent numeracy skills enhances the ability to process and interpret data.
•An A level Mathematics course gives students the opportunity to study ‘pure’ topics such as geometry, calculus and trigonometry and to use these ideas within the 'applied' topics such as mechanics and statistics.
•The 'applied’ disciplines of mechanics and statistics require mathematical modelling to make sense of real-life problems. Students will learn how to model real-life situations in mathematical terms, how models are refined and how to identify limitations within this process.
•Students need an enthusiasm for problem-solving, and the course suits those with the tenacity and resilience to keep going in the hunt for possible solutions to awkward problems.
•Although mathematics is highly logical, it also requires imagination and determination to work well on your own: working on problems is the surest way to develop the knowledge and intuition required to do well and to develop the discipline needed to clearly communicate the solution.

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history’s most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Year 7 Curriculum Map [Term 01]	
Sequence of Knowledge	Narrative
• Prime numbers & proof • FDP equivalence • Sequences • Algebraic notation • Equality & equivalence	The first three units underpin key skills required for KS3 mathematics with call backs to KS2 skills & ensuring these are embedded. There is a introduction to formal algebraic notation which is not always done formally in KS2.

Year 7 Curriculum Map [Term 02]	
Sequence of Knowledge	Narrative

• Place Value • Solving problems with addition / subtraction • Solving problems with multiplication / division • Fractions & percentage of amounts	The units covered in this term review key skills from KS2 and ensure they are embedded. The units are key to strengthening number work and looking at a variety of methods that can be used.

Year 7 Curriculum Map [Term 03]	
Sequence of Knowledge	Narrative
• Directed number • Addition & subtraction of fractions • Constructing, measuring using geometric notation • Developing geometric reasoning • Sets & probability	The first two units build upon the number & fraction work from term 1 & 2 including combining skills and further problem solving. The second two units involve looking at geometry, which requires number work skills taught in previous terms. Final unit introduces formal probability concepts building on likelihood taught at KS2.

Year 8 Curriculum Map [Term 01]	
Sequence of Knowledge	Narrative
• Ratio & scale • Multiplicative Change • Multiplying & dividing fractions • Representing data • Tables & probability	First three units continue to build on the fraction & number work from Year 7 with formal introduction of ratio (including problem solving) & comparing with fractions. The second two units involve build on the small probability unit in Year 7 with further development of using probability with data.

Year 8 Curriculum Map [Term 02]

Sequence of Knowledge	Narrative
• Brackets, equations & inequalities • Sequences • Indices • Fractions & percentages • Standard index form • Number sense	First three units involve building on the algebra introduced Year 7 alongside the secure number skills taught in Year 7 & engages students in problem solving using algebraic methods. Second three units build upon further number skills to reinforce number skills with contextualised questions.

Year 8 Curriculum Map [Term 03]	
Sequence of Knowledge	Narrative
• Angles in parallel lines & polygons • Area of trapezium & circles • Line symmetry & reflection • Data handling • Measures of location	First three units build on the geometry skills from Year 7 with further development of angle facts & areas of more complex shapes. The second two units are taught as a project-based unit around a context involving the data handling cycle. This is fed in from Year 7 data work.

Year 9 Curriculum Map [Term 01]	
Sequence of Knowledge	Narrative
• Straight line graphs • Forming & solving equations • 3D shapes • Testing conjectures • Numbers	The first term in Year 9 involves reviewing and further developing algebra, geometry & numbers skills taught in Year 7 & 8. This term involves looking at abstract algebraic graphs in full detail for the first time in KS3 for most students.

Year 9 Curriculum Map [Term 02]	
Sequence of Knowledge	Narrative

• Using percentages • Maths & money • Deduction • Rotation & translation • Pythagoras' Theorem	First two units in this term is focus on contextualised problems involving money, tax & percentages. The 4th unit builds on symmetry & flection from Year 8 and further develops work on other transformations. Final unit introduces Pythagoras' Theorem following algebra work completed in Year 7 & 8.

Year 9 Curriculum Map [Term 03]	
Sequence of Knowledge	Narrative
• Enlargement & similarity • Solving ratio & proportion problems • Rates • Probability • Algebraic representation	The final term in Year 9 pulls together skills taught throughout KS3, building on ratio (including distance / speed / time), transformations, algebra & probability. There is also time planned around revision of KS3 skills in preparation for beginning KS4.

Year 10 Curriculum Map [Term 01]	
Sequence of Knowledge	Narrative
<u>Higher</u> • Work with primes, multiples, factors and indices • Simplify algebraic expressions through expanding brackets and factorising • Determine the nth term for linear and quadratic sequences • Interpret and represent data in a variety of styles including grouped and un-grouped data • Use ratio and proportion to simplify and solve complex problems <u>Foundation</u> • Work with place value to multiply, divide and round numbers • Work with primes, multiples, factors and indices • Use fractions with the 4 operations	During the first term both Higher and Foundation curriculums focus on building connections between topics introduced at KS3. These links help to strengthen student's understanding of topics and allows them to further their knowledge across all key topics areas focussed on at GCSE.

• Find a fraction/percentage of another number • Increase/decrease by a percentage • Substitute positive and negative numbers into algebraic expressions • Expand and factorise expressions with brackets • Solve linear expressions involving brackets and repeated variables • Use a variety of graphs, tables and charts to represent a given data set	

Year 10 Curriculum Map [Term 02]	
Sequence of Knowledge	Narrative
<u>Higher</u> • Apply interior and exterior angles in a polygon to solve problems • Solving linear equations and inequalities involving repeated variables, brackets and fractions • Use right-angled trigonometry to calculate missing angles and sides in triangles • Apply the general formula for straight line graphs toa variety of topics introducing perpendicular lines and the graph of a circle <u>Foundation</u> • Apply known angle factors to more complex problems • Work in geometry to link area and perimeter in order to apply both topics in real-life contexts • Apply averages and range to a variety of data sets, discussing the benefits and drawbacks of both • Apply the general formula for straight line graphs discussing the real-life links to gradient and y-intercept	The second term broadens student's knowledge across a range of topics. This builds on the foundations from term 1 allowing students in Higher and Foundation to relate new skills to their prior knowledge and continue the links forged in the first term.

Year 10 Curriculum Map [Term 03]	
Sequence of Knowledge	Narrative
<u>Higher</u> • Use non right-angled trigonometry to calculate missing angles and sides in triangles • Use multiplicative reasoning to solve problems real-life context involving bounds and compound interest • Apply circle theorems to a variety of problems <u>Foundation</u>	In term 3 students apply skills to real-life contexts and have a real focus on exam practice in both Higher and Foundation curriculums. This allows students to see how their topics link to the real-world and invests

• Use standard form to work with extremely large/small numbers in context • Use right-angled trigonometry to calculate missing angles and sides in triangles • Apply probability to a variety of real-life situations, discussing the ways in which to represent a probability • Apply and describe the 4 transformations to shape on a sqaure grid	time into students seeing the benefit of the subjects they are learning. Exam practice gives students the chance to apply the topics learnt in lesson in an exam setting. These questions strongly build on the inter-leaving from Terms 1 and 2 ensuring students can pull together a variety of skills to answer a question.

Year 11 Curriculum Map [Term 01]	
Sequence of Knowledge	Narrative
<u>Number</u> Types of number Working with fractions and percentages Working with surds Working with bounds <u>Algebra</u> Manipulating and simplifying algebraic expressions Solving linear and quadratics equations Working with sequences	In term 1 both tiers recap Number and Algebra (fundamental topics from the GCSE). Through both topics students interleave geometry, ratio and probability ensuring that a wide range of skills and topics are converted during this first term.

Year 11 Curriculum Map [Term 02]	
Sequence of Knowledge	Narrative
<u>Geometry</u> Angle facts Deducing missing sides and angles in triangles Properties of 2D and 3D shapes <u>Statistics</u> Graphs and charts Representing data <u>Ratio and Proportion</u> Sharing into a given ratio Simplifying and use a ratio Using direct and inverse proportion properties	In the 2nd term students will complete exam cycles consisting of in-class exams and class specific focusses that arise from this data. This allows all students a personalised plan and ensures students are able to re-visit topics as and when necessary.

Year 11 Curriculum Map [Term 03]	
Sequence of Knowledge	Narrative

Exam practice and GCSE exams.	During this term students will complete their GCSE examinations. To best support with this students will complete exams in and out of class and work on key topics in order to achieve the best grade possible.

Year 12 Curriculum Map [Term 01]	
Sequence of Knowledge	Narrative
Pure Maths • Algebraic expressions • Quadratics • Equations and Inequalities • Graphs and Transformations • Straight Line Graphs • Circles • Algebraic Methods	The start of this course builds on the algebraic skills have learned at GCSE. These skills underpin everything we do, necessitating an intensive period of revision and consolidation. We extend students' understanding within this framework using algebraic and/or visual derivations alongside alternative ways of thinking about the ideas or applications.
Applied Maths - Mechanics • Constant Acceleration • Modelling in Mechanics • Forces and Motion	The mechanics content has historically been a challenge for our students. With this in mind we have given early exposure the mechanics module. We are looking at a more practical approach to tackling projectile motion and other motion under gravity that will be both engaging and purposeful. Indeed, testing these ideas with empirical evidence is essential when attempting to model the real world. There are prerequisites from pure, but have been included as part of the teaching for mechanics.

Year 12 Curriculum Map [Term 02]	
Sequence of Knowledge	Narrative
Pure Maths • Trigonometric Ratios • Trigonometric Identities • Vectors • Differentiation • Integration • Exponentials and Logs • Binomial Expansion	These topics should capture "hearts and minds". These new concepts will be introduced, applied and mastered as they are building blocks for year 13 content. Time has been allocated appropriately to ensure a solid foundation is created.

Applied Maths - Statistics • Data Collection • Measures of Location and Spread • Representations of Data • Correlation • Probability	We introduce the first statistics components at this point Students ponder practical question. Students have studied "data" at GCSE, but this part of the course provides mathematical analytical tools for modelling and decision making.

Year 12 Curriculum Map [Term 03]

Sequence of Knowledge	Narrative
Pure Maths • Algebraic Methods • Radians • Trigonometric Functions • Trigonometry and Modelling	Traditional year 13 topics are taught at this point to provide an exposure and expectation of the complexity of year 13.
Applied Maths - Statistics • Statistical Distributions • Hypothesis Testing	Continuing with statistics, these topics cover the analysis of different data distribution and testing tolerances and confirm set Hypothesis.

Year 13 Curriculum Map [Term 01]

Sequence of Knowledge	Narrative
Pure Maths • Trigonometry and Modelling • Differentiation • Integration	The bonus of covering some of the more rigorous topics early is the potential to practice their content for a longer period in preparation for the external examinations. The obvious downside to this approach is that there is more time to forget the content. The core retrieval and revision within students' independent study will be tested regularly with homework, mini quizzes and assessments.
Applied Maths – Statistics • Conditional Probability • The Normal Distribution **Applied Maths – Mechanics** • Forces and Friction Moments • Forces and Friction • Projectiles	Problem solving and industry standard statistics are brought into practice for these topics, which concludes the course. We return to mechanics, with pre requisite Pure maths having been taught

	and now can be applied in these situations.

Year 13 Curriculum Map [Term 02]	
Sequence of Knowledge	Narrative
Pure Maths • Parametric Equations • Sequences and Series • Binomial Expansion • Functions and Graphs • Numerical Methods • Vectors **Applied Maths – Mechanics** • Projectiles • Applications of Forces • Further Kinematics	The final stretch brings us to topics that will include “real life” modelling scenarios. Teaching for understanding and application is fundamental for these topics. The course ends with some interesting applications of vector calculus in a mechanics setting

Year 13 Curriculum Map [Term 03]	
Sequence of Knowledge	Narrative
Examinations Preparation	From QLA of latest Mocks, pupils are provided with revision material and exam style practice topic questions and complete past exam papers.